

digital inclinometers and protractor wheel and pointer assemblies.

18.4.1 Perform the following procedures on the main probe with all devices that will be attached to the main probe in the field [such as thermocouples, resistance temperature detectors (RTDs), or sampling nozzles] that may affect the flow around the probe head. Probe shaft extensions that do not affect flow around the probe head need not be attached during calibration.

18.4.2 The procedures below assume that the wind tunnel duct used for probe calibration is horizontal and that the flow in the calibration wind tunnel is axial as determined by the axial flow verification check described in section 10.1.2. Angle-measuring devices are assumed to display angles in alternating 0° to 90° and 90° to 0° intervals. If angle-measuring devices with other readout conventions are used or if other calibration wind tunnel duct configurations are used, make the appropriate calculational corrections. For Type-S probes, calibrate the A-side and B-sides separately, using the appropriate scribe line (see section 18.3, above), if both the A and B sides of the pitot tube are to be used for yaw angle determinations.

18.4.2.1 Position the angle-measuring device in accordance with one of the following procedures.

18.4.2.1.1 If using a digital inclinometer, affix the calibrated digital inclinometer to the probe. If the digital inclinometer can be independently adjusted after being locked into position on the probe sheath (e.g., by means of a set screw), the independent adjustment must be set so that the device performs exactly like a device without the capability for independent adjustment. That is, when aligned on the probe the device must give the same readings as a device that does not have the capability of being independently adjusted. Either align it directly on the reference scribe line or on a mark aligned with the scribe line determined according to the procedures in section 18.1.1.1. Maintaining this rotational alignment, lock the digital inclinometer onto the probe sheath.

18.4.2.1.2 If using a protractor wheel and pointer device, orient the protractor wheel on the test port so that the 0° mark is aligned with the longitudinal axis of the wind tunnel duct. Maintaining this alignment, lock the wheel into place on the wind

tunnel test port. Align the scribe line on the pointer collar with the reference scribe line or with a mark aligned with the reference scribe line, as determined under section 18.1.1.1. Maintaining this rotational alignment, lock the pointer device onto the probe sheath.

18.4.2.2 Zero the pressure-measuring device used for yaw nulling.

18.4.2.3 Insert the probe assembly into the wind tunnel through the entry port, positioning the probe's impact port at the calibration location. Check the responsiveness of the pressure-measuring device to probe rotation, taking corrective action if the response is unacceptable.

18.4.2.4 Ensure that the probe is in a horizontal position using a carpenter's level.

18.4.2.5 Rotate the probe either clockwise or counterclockwise until a yaw null [zero ΔP for a Type S probe or zero $(P_2 - P_3)$ for a 3-D probe] is obtained. If using a Type S probe with an attached thermocouple, the direction of the probe rotation shall be such that the thermocouple is located downstream of the probe pressure ports at the yaw-null position.

18.4.2.6 Read and record the value of θ_{null} , the angle indicated by the angle-measuring device at the yaw-null position. Record the angle reading on a form similar to Table 2G-6. Do not associate an algebraic sign with this reading.

18.4.2.7 Determine the magnitude and algebraic sign of the reference scribe line rotational offset, R_{SLO} . The magnitude of R_{SLO} will be equal to either θ_{null} or $(90^\circ - \theta_{null})$, depending on the type of probe being calibrated and the type of angle-measuring device used. (See Table 2G-7 for a summary.) The algebraic sign of R_{SLO} will either be positive if the rotational position of the reference scribe line is clockwise or negative if counterclockwise with respect to the probe's yaw-null position. Figure 2G-10 illustrates how the magnitude and sign of R_{SLO} are determined.

18.4.2.8 Perform the steps in sections 18.3.2.3 through 18.3.2.7 twice at each of the two calibration velocities selected for the probe under section 10.6. Record the values of R_{SLO} in a form similar to Table 2G-6.

18.4.2.9 The average of all R_{SLO} values is the reference scribe line rotational offset for the probe.

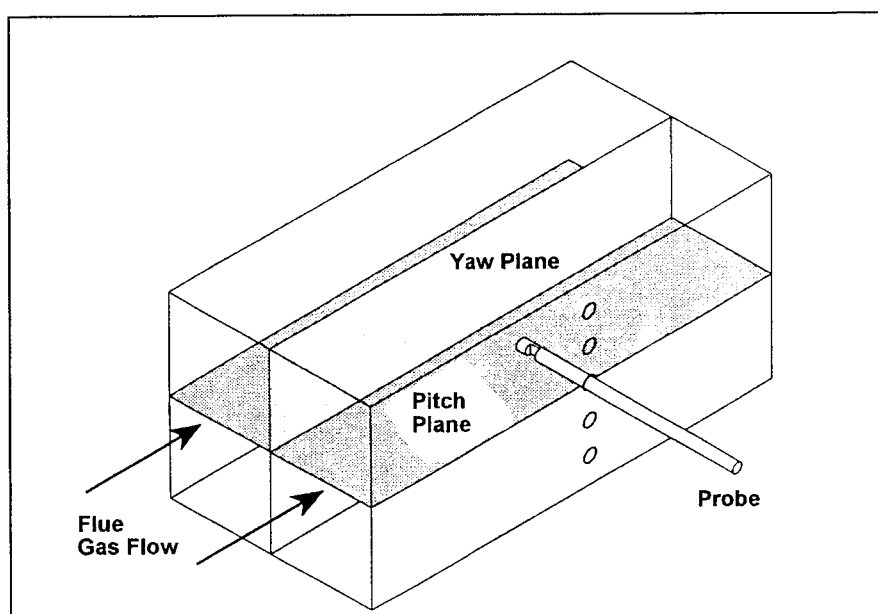


Figure 2G-1. Illustration of yaw and pitch planes in stack or duct.